

U.S. Fire Administration / National Fire Academy

Coffee Break Training

Topic: Fire Protection Water Supplies

Learning objective: The student shall be able to compute the volume of an elevated cylindrical tank.

Any good preincident plan includes an evaluation of the fire flow needed to control an incident, as well as identifies all the available water sources to meet the required flow.

While many jurisdictions have the ability to draw water from large municipal sources such as reservoirs, lakes, and rivers connected through a waterworks system to a variety of fire hydrants, this arrangement is not available to everyone.

In rural and suburban areas, for example, fire crews often have to rely on alternative water supplies. One of these alternatives may be a free-standing cylindrical tank that is provided solely for fire protection, like the one pictured.

It is essential for preincident planning purposes to know how much water the tank will hold and is available for fire suppression. If the tank's volume is unknown, how does one determine the number of gallons it holds?

A simple two-step mathematical exercise will provide the answer:

1. Determine the volume of the cylinder in cubic feet (cubic meters).
2. Multiply the volume times 7.48 (gallons in a cubic foot) or 1,000 (liters in a cubic meter).

To determine the volume of the cylinder in cubic feet, use the formula

$$\pi r^2 h = \text{volume in cubic feet}$$

Where,

$$\pi = 3.1416$$

$$r^2 = \text{the tank radius in feet (meters) squared}$$

$$h = \text{the tank's height in feet (meters)}$$

Given a tank that has a radius of 8 feet (2.438 m) and a height of 20 feet (6.096 m), what is its volume in gallons (liters)?



Gallons	Liters
$3.1416 * (8^2) * 20 = ?$	$3.1416 * (2.438^2) * 6.096 = ?$
$3.1416 * (64) * 20 = 4021.2 \text{ ft}^3$	$3.1416 * (5.943) * 6.096 = 113.815 \text{ m}^3$
$4021.2 \text{ ft}^3 * 7.48 = 30,078 \text{ gallons}$	$115.788 \text{ m}^3 * 1000 = 113,815 \text{ L}$

Do not climb an elevated tank without the owner's permission and appropriate fall-protection safety equipment.